UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
841 Chestnut Building
Philadelphia, Pennsylvania 19107

SUBJECT: USX CLAIRTON
Quench Water IsOsue

DATE: MAY 24 1995

FROM: Makeba A. Morris, Chief *Makeba A. Morris*
Technical Assessment Section (3AT22)

TO: David B. McGuigan, Chief
Air Enforcement Section (3AT11)

As requested in your memo, dated April 19, 1995, we have evaluated the ambient impacts of the quenching emissions originating from the USX Clairton Coke Works. As you requested, we have used the dispersion model selected for the Allegheny County PM-10 SIP and quench tower input data specified in that model. The attached report is a summary of the evaluation of particulate emissions from the Clairton Coke Works' quench towers.

The evaluation indicates that, at the point of maximum concentration, the annual average PM-10 could be reduced by 0.49 $\mu g/m^3$ if river water only were to be used for coke quenching. Similarly, the maximum 24-hour concentration of PM-10 could be reduced by up to 3.33 $\mu g/m^3$ if river water only were to be used for coke quenching.

If you have questions about this evaluation, please contact Denis Lohman.

Attachment

MODELING OF QUENCH TOWER PARTICULATE EMISSIONS
USX CLAIRTON COKE WORKS

The only difficult part of the requested evaluation was to specify the mass emission rates to model. The key parameters analyzed in the sump (and river) samples are summarized in the attached tables. Subsequent evaluation was limited to the Total Solids parameter for several reasons:

- Total solids were the parameter reported of greatest magnitude;
- All other parameters should be represented as a fraction of total solids; and
- Total solids are most closely representative of PM-10 which was modeled for the Allegheny County SIP.

Through discussions with Tom Casey, who supervised the Allegheny County SIP modeling, it was determined that the quench tower emissions were calculated using the AP-42 factors for "Clean Water with baffles." (Note: The AP-42 defines "Clean Water" as clean make-up water as opposed to using process water for make-up.) The PM-10 emission factor in AP-42 is 0.03 kg/Mg (0.05 lb/ton). In researching the derivation of the AP-42 emission factor, it was determined that particulate emissions in towers with multiple row baffles were found to be related to total solids concentration by the equation[1]:

$$E = 4.02 \times 10^{-5}\,(TS) + 0.227$$

where E = emissions (kg/Mg)
TS = total solids concentration in the quench water (mg/l)

The mean total solids (TS) measured in the sump sampling program were used to calculate the particulate emissions factor for each of the quench tower sumps and for the river sample. For each sump the emissions factor for the sump TS and the river TS was calculated as follows:

Source	Total Solids	kg/Mg
River	211	0.2355
Sump #3	491	0.2467
Sump #5	412	0.2436
Sump #7	491	0.2467
Sump #B	564	0.2497

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[1] J. Jeffrey, Wet Coke Quench Tower Emission Factor Development, Dofasco, Ltd., EPA-600/X-85-340, U. S. Environmental Protection Agency, Research Triangle Park, NC, August 1982.

Because the calculated emissions are total particulate and to avoid the necessity of re-estimating the process factor and to maintain consistency with the SIP demonstration, the emissions difference was prorated to the emissions rate used in the SIP demonstration to calculate a mass emission rate to model. This presumes that the PM-10 fraction from the river water would be the same as the PM-10 fraction from the sump. If, as expected, the river water would have a higher PM-10 fraction, the emission rate modeled would be less. The resulting emission rates, representing the difference between quenching with river water and recycled water, are as follow:

Quench Tower	PM-10 SIP grams/sec	$PM\text{-}10_{Rvr}$ grams/sec	Difference grams/sec
1	1.00	0.955	0.045
3	0.99	0.945	0.045
5	0.96	0.928	0.032
7	1.20	1.146	0.055
B	0.91	0.858	0.052

The emission rate differences were modeled with the ISCST2 model used for the PM-10 SIP demonstration. The source parameters for the quench towers, the meteorology, and the receptors were all used as used in the SIP demonstration.

The attached summary of results characterizes the estimate of PM-10 reduction that would be obtained by using only river water for coke quenching in place of using recycled water with river water used to replace evaporated losses. The maximum calculated annual improvement would be 0.49 $\mu g/m^3$, which is 1 percent of the PM-10 annual NAAQS. The maximum calculated 24-hour improvement would be 3.3 $\mu g/m^3$, which is 2.2 percent of the PM-10 24-hour NAAQS.

ALLEGHENY COUNTY QUENCH SUMP SAMPLING
RIVER WATER INTAKE (mg/l)

	Ammonia	Phenol	CN[2]	TDS[3]	TS[4]	SS[5]
DER	.130	0.00		NA[6]	190.00	34.00
	.140	0.00		154.00	204.00	50.00
	NA	0.00		NA	NA	NA
	.090	0.00		174.00	204.00	30.00
	.090	0.00		160.00	162.00	2.00
US STEEL	.250	.002		120.00	240.00	66.00
	.070	.002		150.00	190.00	13.00
	.025	.012		180.00	290.00	130.00
AVG DER	.113	0.00		162.67	190.00	29.00
AVG USX	.115	.005		150.00	240.00	69.67
AVG ALL	.114	.002		156.33	211.43	46.43

SUMP FOR BATTERIES 1-3, 7-9 (mg/l)

	Ammonia	Phenol	CN	TDS	TS	SS
DER	.290	.064	.070	376.00	558.00	182.00
	.730	.113	.073	336.00	470.00	134.00
	.260	.145	.075	314.00	558.00	244.00
	.260	.060	.070	360.00	552.00	192.00
	.230	.075	.085	342.00	390.00	48.00
US STEEL	.360	.120	.009	390.00	430.00	91.00
	.390	.120	.005	330.00	550.00	140.00
	.025	.064	.0025	330.00	420.00	51.00
AVG DER	.354	.091	.0746	345.60	505.60	160.00
AVG USX	.258	.101	.0055	350.00	466.67	94.00
AVG ALL	.318	.095	.0488	347.25	491.00	135.25

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[2]Cyanide

[3]Total Dissolved Solids

[4]Total Solids

[5]Total Suspended Solids

[6]Not Analyzed

ALLEGHENY COUNTY QUENCH SUMP SAMPLING

SUMP FOR BATTERIES 13-15 (mg/l)

	Ammonia	Phenol	CN	TDS	TS	SS
DER	.330	.010	NA	340.00	400.00	60.00
	.290	.035	.080	306.00	352.00	46.00
	.320	.023	.155	292.00	364.00	72.00
	.150	.050	.150	394.00	520.00	126.00
	.310	.083	.200	318.00	362.00	44.00
US STEEL	.420	.024	.021	340.00	370.00	54.00
	.500	.028	.005	280.00	410.00	58.00
	.110	.015	.017	380.00	520.00	92.00
AVG DER	.280	.040	.146	330.00	399.60	69.60
AVG USX	.343	.022	.014	333.33	433.33	68.00
AVG ALL	.304	.034	.090	331.25	412.25	69.0

SUMP FOR BATTERIES 19-20 (mg/l)

	Ammonia	Phenol	CN	TDS	TS	SS
DER	NA	.144	.125	NA	NA	NA
	.650	.215	.110	342.00	554.00	212.00
	.430	.063	.130	310.00	454.00	144.00
	.380	.215	.300	438.00	508.00	70.00
	.570	.288	.280	324.00	498.00	174.00
US STEEL	.580	.140	.0025	340.00	420.00	58.00
	.470	.250	.005	310.00	520.00	140.00
	.025	.200	.025	390.00	480.00	72.00
AVG DER	.508	.185	.189	353.50	503.50	150.00
AVG USX	.358	.197	.011	346.67	473.33	90.00
AVG ALL	.444	.189	.122	350.57	490.57	124.29

SUMP FOR BATTERY B (mg/l)

	Ammonia	Phenol	CN	TDS	TS	SS
DER	.650	.005	.155	404.00	546.00	142.00
	.630	.083	.108	440.00	510.00	70.00
	.670	.015	.155	374.00	828.00	454.00
	.640	.065	.250	450.00	514.00	64.00
	.510	.005	.205	344.00	512.00	168.00
US STEEL	.690	.240	.013	440.00	490.00	98.00
	.850	.098	.007	410.00	610.00	98.00
	.120	.089	.022	420.00	500.00	57.00
AVG DER	.620	.035	.175	402.40	582.00	179.60
AVG USX	.553	.142	.014	423.33	533.33	84.33
AVG ALL	.595	.075	.114	410.25	563.75	143.88

*** ISCSTDFT VERSION 94340 ***
*** CLAIRTON QUENCH WATER COMPARISON ***
05/19/95 *** *** 08:12:02
*** MODELING OPTIONS USED: CONC RURAL ELEV DFAULT

*** POINT SOURCE DATA ***

SOURCE	NUMBER PART.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)
STACK1	0	0.45400E-01	595930.0	4461510.0	231.0	30.50	373.00	3.00	3.20
STACK2	0	0.44900E-01	595970.0	4461550.0	231.0	30.50	373.00	3.00	5.20
STACK3	0	0.31900E-01	595440.0	4461870.0	231.0	30.50	373.00	3.00	5.20
STACK4	0	0.54500E-01	595400.0	4461830.0	231.0	37.20	373.00	3.00	8.80
STACK5	0	0.51800E-01	595430.0	4462160.0	231.0	41.10	373.00	3.00	9.60

*** THE SUMMARY OF MAXIMUM PERIOD (8760 HRS) RESULTS ***

** CONC OF TDS IN MICROGRAMS/M**3 **

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GROUP ID                    AVERAGE CONC        RECEPTOR  (XR, YR, ZELEV, ZFLAG)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
     ALL 1ST HIGHEST VALUE IS 0.48949 AT (596500.00, 4462000.00,    335.30, 0.00)
         2ND HIGHEST VALUE IS 0.48271 AT (596250.00, 4462000.00,    335.30, 0.00)
         3RD HIGHEST VALUE IS 0.40687 AT (596000.00, 4462500.00,    354.80, 0.00)
         4TH HIGHEST VALUE IS 0.38442 AT (596500.00, 4462250.00,    335.30, 0.00)
         5TH HIGHEST VALUE IS 0.33524 AT (596250.00, 4462500.00,    354.80, 0.00)
         6TH HIGHEST VALUE IS 0.33454 AT (596500.00, 4461750.00,    335.30, 0.00)
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*** THE SUMMARY OF HIGHEST 24-HR RESULTS ***

** CONC OF TDS IN MICROGRAMS/M**3 **

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GROUP ID                  AVERAGE CONC  (YYMMDDHH)          RECEPTOR  (XR, YR, ZELEV)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
    ALL HIGH 1ST HIGH VALUE IS 3.32921 ON 91020424:  AT (596250.00, 4462000.00, 335.30)

        HIGH 2ND HIGH VALUE IS 3.31508 ON 91110124:  AT (596250.00,  4462000.00, 335.30)
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*** THE SUMMARY OF HIGHEST 1-HR RESULTS ***

** CONC OF TDS IN MICROGRAMS/M**3 **

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GROUP ID                  AVERAGE CONC  (YYMMDDHH)       RECEPTOR  (XR, YR, ZELEV)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
ALL     HIGH 1ST HIGH VALUE IS 9.71195 ON 91052623:  AT (596250.00, 4462000.00, 335.30)

        HIGH 2ND HIGH VALUE IS 9.71195 ON 91062122:  AT (596250.00, 4462000.00, 335.30)
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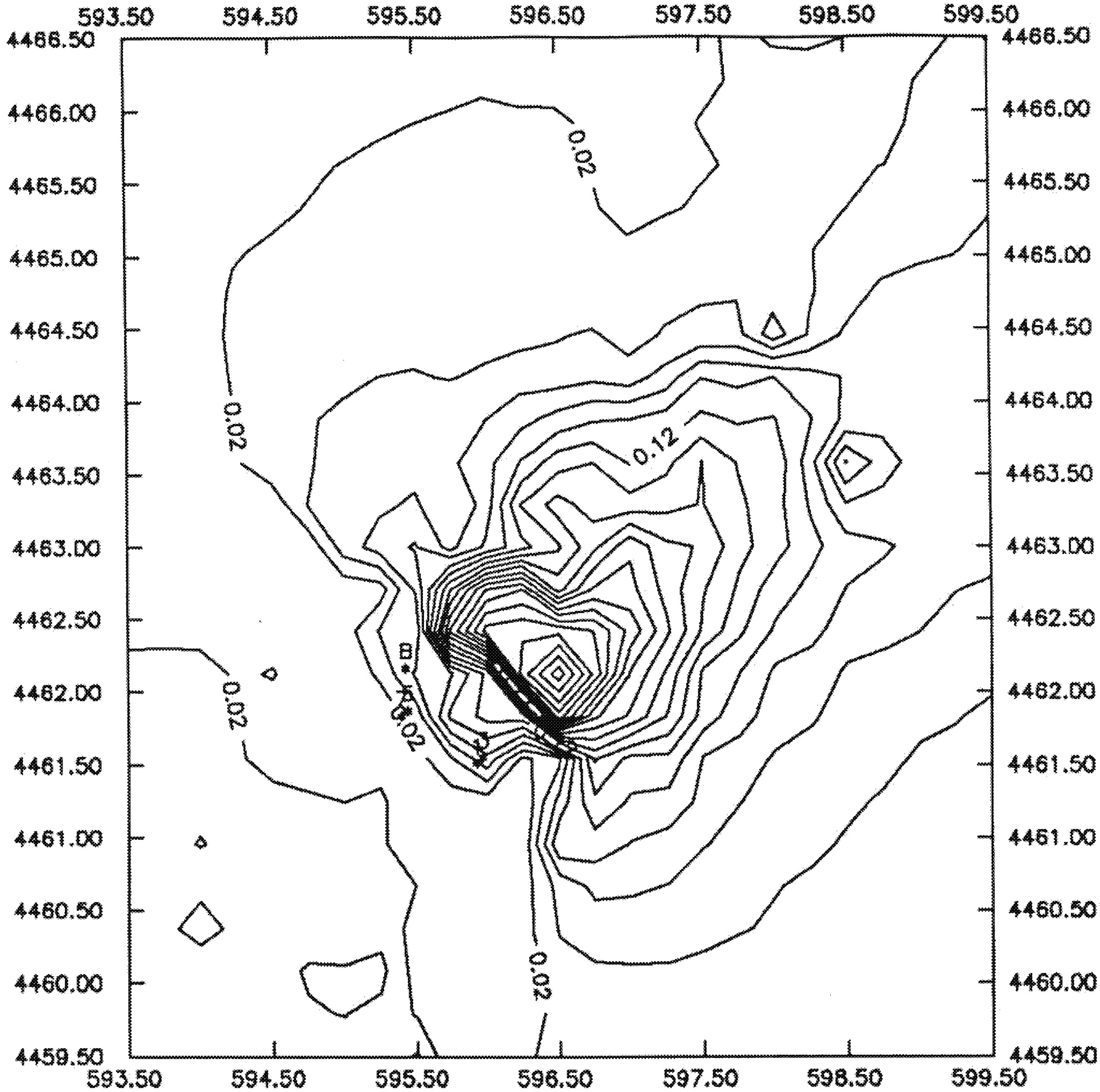
QUENCHWATER * Annual (ug/m3)



QUENCHWATER * 24-hr (ug/m3)